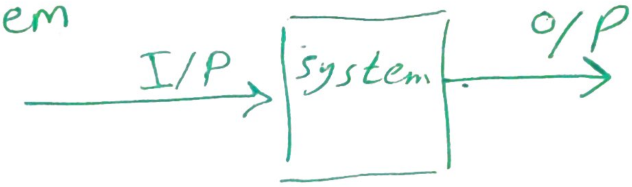
محاضرة 1 د. محمد عرفة الثلاثاء 29/9/2015

Review on systems and signals :-

system

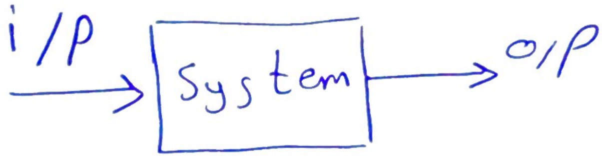


$$T.F. = \frac{O/P(s)}{I/P(s)}$$

classification of Systems

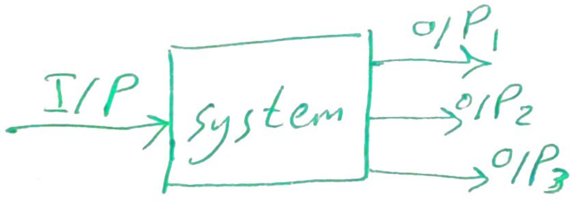
1 No. of I/Ps and O/Ps

A- SISO System (Single Input single output)

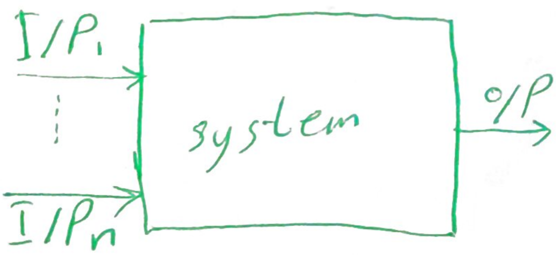


Multi

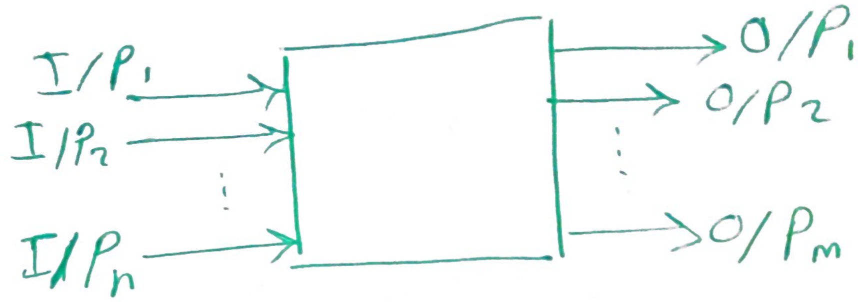
B- SIMO System



C- MISO

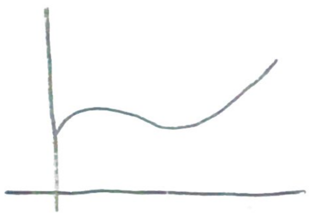


D - MIMO System



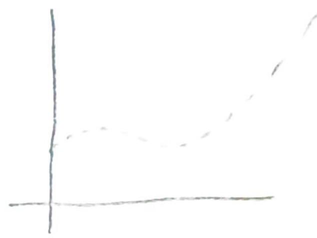
[2] Continouity of Signal

① Cont. time system



≡ Analog System

discrete time system

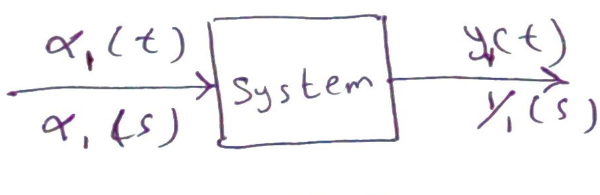


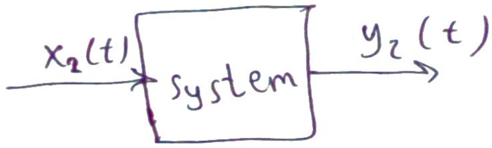
≡ Digital System.

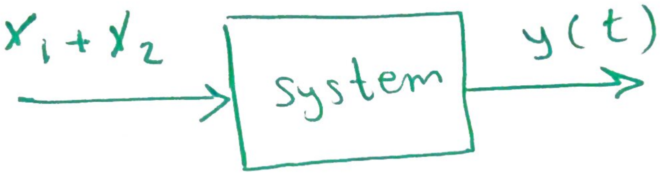
[3] linearity Property

linear System

Non-linear system







$y(t) = y_1(t) + y_2(t) \Rightarrow$ linear System

if $y(t) \neq y_1(t) + y_2(t)$ = non-linear System

(4) physical Comp.

A- electrical System

B- Mech. System

C- Electro Mech. System.

D- fluid System

A System can be in the form of:

1. physical model
2. Block Diagram OR Signal flow graph
3. State-Space equation
4. system equations
5. Transfer Function (T. F.)

$\Longrightarrow$ Turn Over

System Response

≡ O/P in time-domain

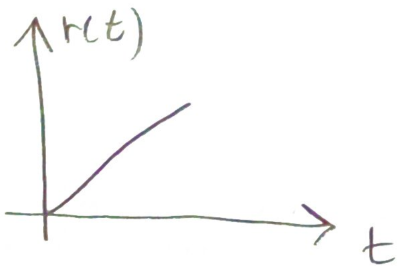
$$T.F. = \frac{Y(s)}{R(s)} \Rightarrow Y(s) = [T.F]R(s)$$

$$L^{-1}(Y(s)) = y(t) = L^{-1}[T.F. * R(s)]$$

According to the I/P

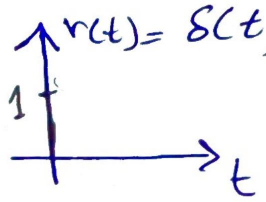
1. Step Response ($r(t) = k$)

2. Ramp Response ($r(t) = K(t)$)



③ Parabolic I/P ($r(t) = Kt^2$)

④ Impulse Response ($r(t) = \delta(t)$)

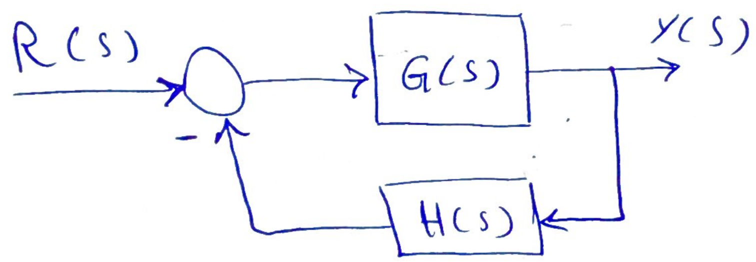


$r(t) = \delta(t) = \begin{cases} 1, & t = 0 \\ 0, & \text{otherwise} \end{cases}$

Stability

Stable ⇒ for bounded i/P, there exist bounded output (o/P).

Feedback System



$$T.F = \frac{G(s)}{1 + G(s)}$$

Closed Loop T.F. = C.L.T.F = T.F.

open Loop T.F. = O.L.T.F = GH(s)

ch. eqn ⇒ $\boxed{1 + GH(s) = 0}$

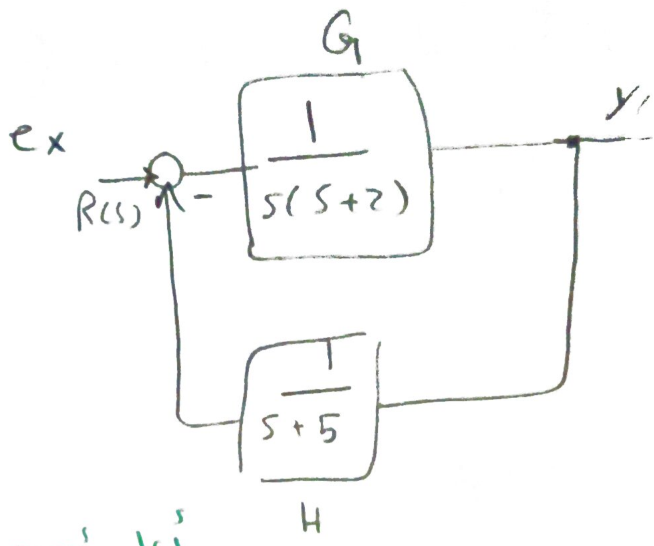
$$T.F. = \frac{\text{بسط}}{\underbrace{\text{مقام}}_{=0}}$$

Poles ⇒ The root of ch. eqn.

Zeros ⇒ The values of S that make G(S) = 0

System type $\Rightarrow$ O.L.T.F.

System order
or $''$ degree

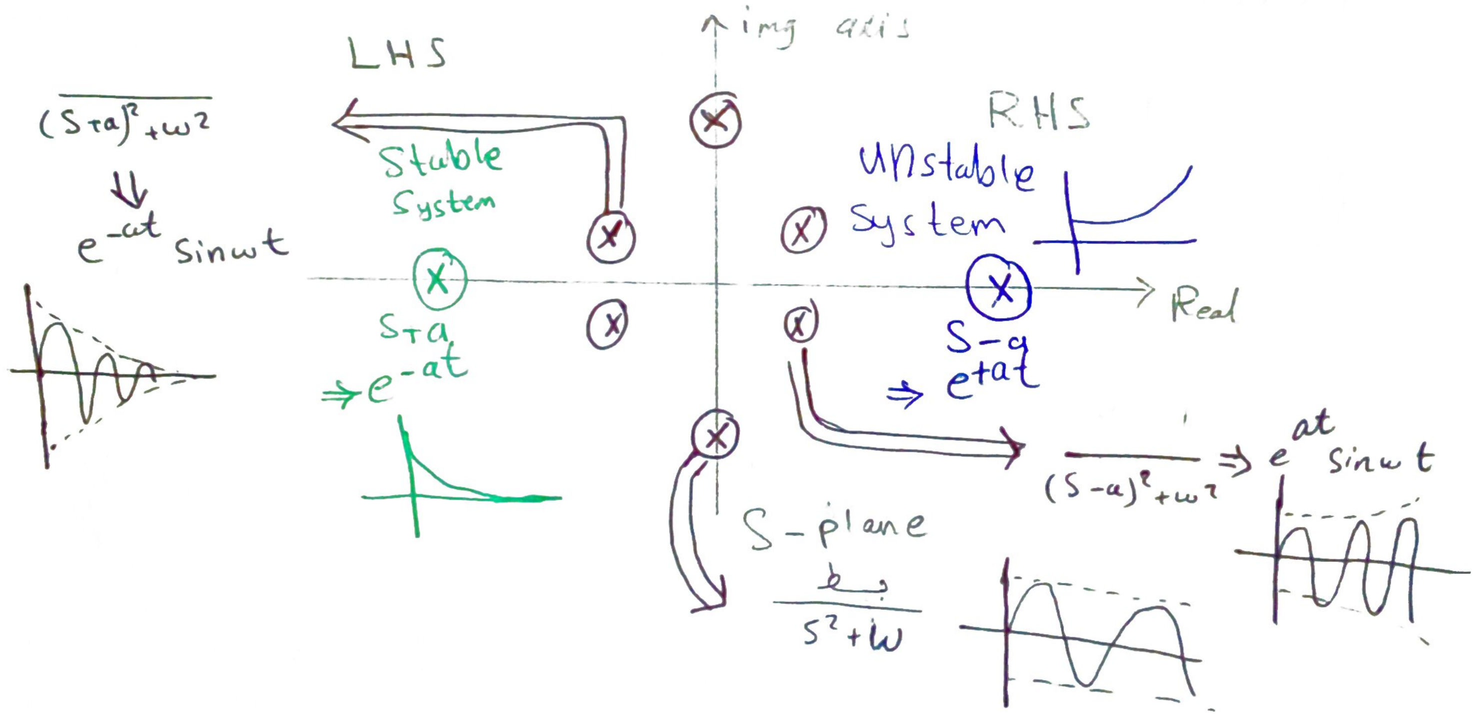


$$O.L.T.F = \frac{1}{s(s+2)(s+5)}$$

$\therefore$ System type = 1

order = 3rd order — أعلى أس لـ S

To check the system stability using the poles location.



To check the System Stability

Algebric Method

- Routh Method

Graphical Method

this semester ⇒
- Root Locus
- Bode diagram
- Polar plot

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① Relative Stability
- → Bode Diagrams
- → polar plot

② Absolute stability

- Routh Array
  - → stable
  - → unstable
  - → Critically Stable

المراجع : الأهم ↓ الأقل

1- Modern Control System
"Roland S. Burns"

2- Introduction to Control Engineering
Modeling, Analysis, Design
"Ajit K. Mandal"

3- Modern Control Engineering
" K. OGata "

4- Feedback control Systems
"Charles L. philips"

5- Modern control Systems
"Richard C. Dorf)

6- Linear Control system Analysis and design with Matlab "John J. D'Azzo"